Total Factor Productivity, Growth Convergence and Fiscal Policy in Latin America and the Caribbean: Stylized Facts since the 1960s

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The analysis of long-term economic growth in Latin America provides us with a series of stylized facts over time and across countries that may allow us to put forward tentative interpretations for the general economic performance of the region, and therefore to determine the most important sources for long-term economic growth. Besides the dynamics of per capita income, economic outcome trend and volatility, and investment and saving (Sueyoshi, 2008), total factor productivity, income and growth convergence, and fiscal variables have also been identified as important variables that help understand the stylized facts in the region.

The main purpose of this paper is to focus on distinguishing the impact of total factor productivity, which is the "X" factor behind the tangible production factors' contribution, the existence of per-capita income convergence, and finally the effect of tax policy on long-term economic growth.

I.Gross capital formation and total factor productivity

As it is suggested by a vast literature, despite physical and human capital accumulation plays important role in economic growth, they do not account for the total economic growth and for the growth path differences. Supporters of this concept do not discard the importance of capital accumulation in growth process, but question its exclusively granted qualification as main economic growth determinant in the neoclassical theory. [1]

Performing an accounting exercise[2] for the regional countries will allow us to identify whether factor accumulation or TFP has been the main determinant of the economic growth rate. It is considered that the economy can be expressed by a Cobb-Douglas production function, where Y_t denotes the output level, At the technology parameter, K_t the stock of capital factor, L_t the stock of human capital factor, and α is a constant for the share of capital in the total output, and it is assumed to have constant returns to scale.[3]

$$Y_t = A_t \ K_t^{\alpha} \ L_t^{1-\alpha} \qquad \text{Where } 0 < \alpha < 1 \tag{1}$$

If we take logs and differentiate with respect to time we have as follows:

$$g_y = g_A + \alpha g_K + (1-\alpha) g_L \tag{2}$$

In order to have an estimate of productivity, equation 2 is rewritten:

$$g_A = g_y - \alpha g_K - (1-\alpha) g_L \tag{3}$$

As it can be clearly observed in equation 3, an estimation of α, the share of capital in output is needed. One method to estimate this parameter is by using Ordinary Least Squares (OLS) estimates of the production function, and the other is merely by taking the estimated parameters suggested by some researchers. De Gregorio (1992) considers two different capital accumulation shares in a range of 0.65 and 0.70, and 0.45 and 0.55, for Latin American countries during 1950-1985.

By employing OLS, an estimated parameter α of 0.4[4] was found with 95 percent of confidence. Table 1 reports the regression results, where capital accumulation and labor explain a little more than 40 and 50 percent of economic growth, respectively, and both variables show the expected sign and acceptable t statistics. With α equal to 40 percent, which is

within the range of previous studies' estimations, TFP were computed, according to basic growth accounting exercises. By using equation 3, TFP is estimated as a residual of the difference between actual growth and the expected growth from its production factors. Table 2 shows these results, where it is clear TFP decline during the 1980s for all economies, and its recovery in the 1990s. The average TFP growth for the last forty years has been very low for the region, which suggests that some countries had negative TFP growth. In theory this means a backward trend in technology, in other words, technology destruction.

Generally speaking, many regional countries have been affected by protracted external and internal conflicts, related to guerrilla and terrorist movements, eventually supported by drug-trafficking. These events have imposed on those countries high and persistent transaction costs that could be translated into institutional disruption, which along with the already physical-capital damage have affected especially private sector productivity.[5] However, as it was explained in chapter one, TFP comprises a wide range of concepts that urge to be isolated and

Table 1
Latin America: Regression of Production Factors on Output (1960-2001)

R^2 = 0.45, df=40	A	t-statistic
Capital	0.411	3.389
Labor	0.508	4.191

Table 2
Latin America: Decomposition of Economic Growth (1960-2001)

	GDP growth	Capital	Labor	Productivity	Productivity/ GDP (%)
Argentina	2.4	1.3	0.5	0.6	25
Bolivia	2.7	1.2	1.2	0.3	11
Brazil	4.7	2.2	1.5	1.2	26
Chile	4.4	1.5	1.3	1.6	36
Colombia	4.2	2.0	1.0	1.2	29
Costa Rica	4.8	2.3	1.1	1.4	29
D. Republic	5.4	2.9	1.3	1.2	22
Ecuador	4.4	2.1	0.8	1.4	32
El Salvador	3.1	1.4	1.0	0.7	23
Guatemala	4.0	1.5	1.5	1.0	25
Haiti	0.9	0.5	0.0	0.3	33
Honduras	4.0	2.3	1.1	0.6	15
Mexico	4.6	2.4	1.0	1.2	26
Nicaragua	2.3	1.3	0.7	0.3	13
Panama	4.4	2.2	0.9	1.3	30
Paraguay	4.5	2.2	1.3	1.0	22
Peru	3.1	1.4	0.7	1.0	32
Uruguay	1.8	0.8	0.2	0.8	44
Venezuela	2.7	1.7	1.1	-0.1	-4
LAC					
Avg. 60s	4.9	2.5	1.2	1.2	24
Avg. 60-70s	5.0	2.6	1.1	1.3	26
Avg. 80s	1.4	0.5	0.6	0.3	13
Avg. 60-80s	3.8	2.2	1.1	0.5	21
Avg.90s	3.2	1.6	0.5	1.0	31
Avg. 60-90s	3.6	1.5	1.0	1.1	30

Discrepancies in the totals are due to rounding.

analyzed individually in order to reach to concrete determinants of economic growth. TFP could include not only technological change, technological transfer and its spillover effects, but also managerial techniques, and all sorts of innovation leading toward an increase of productivity, basically in benefit of the production process. Technological change implies industrial innovation, information technology nets through telecommunications and internet, research and development programs (R&D) in academic and entrepreneurial spheres, technological transference, and so forth. Then it can be measured by using as proxy variables, the number of patents, number of internet and personal computer users, R&D expenditure, number of scientists and science journals, and royalties and licenses. In the region information technology[6] has given the big and last impulse to Latin America[7] countries to be connected to the rest of the world, but the percentage of the population who can have access to internet services is relatively small. The same applies for people involved in R&D[8] activities, number of patents,[9] exports with technological component, and number of scientific and academic publications.[10]

Table 3
Latin America: Indicators of Innovation and Technology (2001)

	Exports	*R&D*	*Patents*	*Trademarks*	*Royalties*	*Journals*	*Internet users*
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Argentina	8.6	0.45	7533	61828	0.164	2361	9
Bolivia	14.7	0.29	123	n.a.	0.045	33	2
Brazil	18.0	0.77	64686	n.a.	0.225	5144	5
Chile	0.8	0.54	3120	n.a.	0.534	879	20
Colombia	7.0	0.25	1799	12788	0.084	207	3
Costa Rica	28.0	0.20	52437	n.a.	0.300	69	10
D. Republic	0.3	n.a.	n.a.	n.a.	0.104	6	2
Ecuador	4.4	0.09	490	n.a.	0.289	20	3
El Salvador	7.1	2.20	67	n.a.	0.152	3	1
Guatemala	7.5	0.16	226	9821	-0.007	14	2
Haiti	6.0	n.a.	6	1456	0.000	2	0
Honduras	1.2	n.a.	156	5045	0.164	11	1
Mexico	22.0	0.43	66916	46146	0.061	2291	4
Nicaragua	3.2	0.15	145	n.a.	0.000	8	1
Panama	1.1	0.35	160	13223	0.300	37	3
Paraguay	4.1	n.a.	n.a.	n.a.	-2.399	5	1
Peru	n.a.	0.08	992	n.a.	0.085	229	11
Uruguay	2.2	0.26	616	9741	0.034	144	12
Venezuela	2.2	0.34	2348	23703	0.002	448	5
LAC avg.	7.7	0.44	11872	20417	0.007	627	5
USA	33.2	2.69	331770	292460	-0.239	165430	44
Japan	28.1	2.98	486205	145830	0.016	46951	37
France	23.9	2.15	160181	111780	-0.020	27421	14
Germany	17.6	2.48	262554	97325	0.144	38044	30
Spain	7.8	0.94	202443	98739	0.225	11591	14
Singapore	61.5	1.88	62471	145	n.a	1371	32
Malaysia	58.2	0.40	44948	n.a.	0.586	336	17

Source: World Development Indicators. The World Bank (2004).

(1)High Technology exports (% of manufactured goods).
(2)Research and Development expenditures (% of GDP).
(3)Patents applications, residents and nonresidents.
(4)Trademarks, applications filled.
(5)Net Royalties and licenses payments and receipts (%GDP).
(6)Scientific and technical journals.
(7)Internet users over population.
Data for the year 2001 and for 2000 when 2001 is not available.

In particular, Latin America is a region where technological progress comes from importing technology or training labor force with new skills. If we take a closer look to the figures in the region, it can be noticed that there is a wide disparity among countries, and that Argentina, Brazil, Chile, Costa Rica and Mexico evidence a better technological performance[11]. Besides Costa Rica, Paraguay and Bolivia appeared to be exceptional cases in Latin America regarding certain technological indicators.[12]

Easterly and Levine (2001) and De Gregorio (1992) do not deny the importance of capital accumulation in the economic growth of Latin American countries, but estipulate that its contribution is not as determinant as it is in the case of Southeast Asian countries, and add that total factor productivity is a relevant variable instead. However, since there is no much evidence of technological innovation[13] in the region, it is assumed that spillover effects in addition to economic policy are important determinants of economic growth in LAC economies.

By observing the results in Table 2 we can come across with interesting empirical conclusions that can question basic theoretical assumptions. If we look at this table on a cross-country perspective, it can be observed that the fast growing economies during the period 1960-2001 also have a high contribution ratio of productivity growth on economic growth. If this relationship exists, it means that productivity growth is endogenous against all odds and contrary to the main neoclassical assumptions. According to this school of thought, economic growth in the long term is only caused by an increase in the production factors, capital and labor; and population and technology are exogenous variables.

If we analyze the same table on a time-series perspective, the same pattern is observed. During high growth periods, productivity growth is also high. The accelerated growth in the sixties and seventies due to intensive industrialization process with emphasis on import-substitution is reflected on productivity contribution of around one quarter of the GDP during these decades. In the nineties, economic growth rate in average for Latin American and Caribbean countries was the highest in the period, and productivity rate was also the highest. On the other side, lower productivity growth rates correspond to lower economic growth rates, as in the eighties. This trend suggests the existence of the aforementioned productivity endogeneity that confirms a strong relationship between this variable and economic growth. This in turn calls for further analysis on the economic determinants and their effects on economic growth and productivity growth.

II.Income Per Capita Convergence

The next figures 1 and 2 give us some hints regarding comparative growth paths. These figures are expected to validate the convergence hypothesis- it means a systematic tendency for poor countries to grow faster than rich ones, which would allow them to catch up- and show whether some LAC countries meet this theoretical concept (Barro, 1989). At global level, the neoclassical models of economic growth that are supposed to predict income per capita convergence, fail in their intent and this issue became one of the main critiques in the mainstream economics.

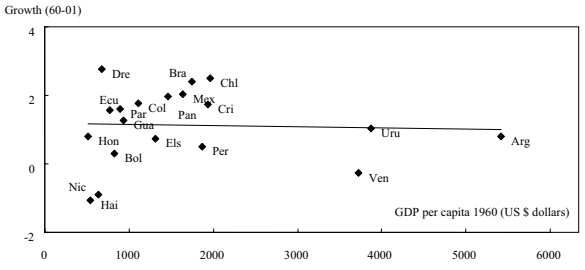

Figure 1
Latin America: Growth and GDP per capita (1960)

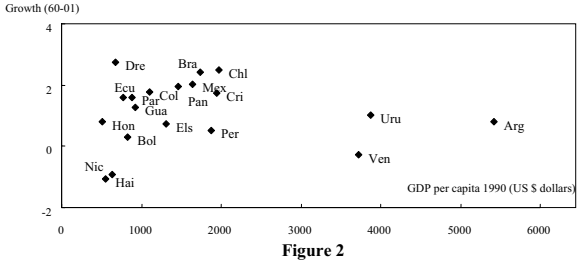

Figure 2
Latin America: Growth and GDP per capita (1990)

Easterly and Levine (2001) remark that the economic history in the last two centuries has been the story of the differences between the richest and the poorest countries, instead of the story of poor countries convergence to the richest steady state. However, for Latin American economies' convergence has been found,[14] which is pretty clear for certain group of countries. One possible reason for that discrepancy between world-wide and regional results may be the existence of some relative homogeneity in this heterogeneous group. A cross country analysis in a region avoids some extreme differences compare to world-wide cross country studies.[15]

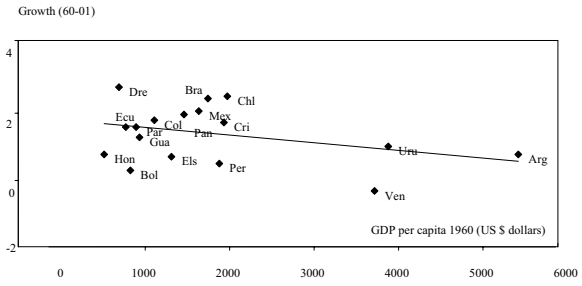

Figure 3
Latin America: Growth and GDP per capita
(1960, excluding Haiti and Nicaragua)

In the examination of long-term economic process there are historical and institutional reasons that make Latin American countries particularly interesting, and that could be the reason for certain homogeneity. These countries shared a common colonial institutional background in that they were all Spanish or Portuguese colonial territories that prior to their independence were governed with a fairly common[16] institutional economic framework (Nishijima and Mc Cleery, 1997). In fact, nowadays the intra-relationships in the region have become closer due to regional[17] and bilateral agreements, and contagion and domino's effects are ineluctable. Looking at both figures, if countries were converging, we were supposed to be able to trace a negative-slope line. Although the points are scattered, it can be said that Chile, Uruguay, Argentina and Venezuela are converging. The poorer countries with less than US$ 800 income per capita in 1960 are comparatively more dispersed, and do not evidence convergence. The reason for this may hinge on the fact that many of these countries were involved in external and internal economic and social conflicts - guerrilla, drug-trafficking, neighbor conflicts - which have affected their growth performance.[18]

While in Figure 2, taking as starting point 1990, clearly two groups can be identified. The first one corresponds to the countries with annual income per capita of less than US$ 1,500, and the second group with more than US$ 1,500. Two interesting conclusions can be drawn from Figure 2. The first group follows no fix pattern, the points remained dispersed, and the countries that can be placed in this group are the same as the poorest ones in Figure 1. Considering 1990 as the initial year, the graphic shows us a clear second group, which neatly converges. Within the group of countries that were relatively well-off by the beginning of 1990s there is convergence to same extent. If we compare Figure 1 and 2, some countries such as Brazil, Costa Rica and Mexico have entered to this convergent group, being possible to understand that the 1990s stabilization and structural reforms pushed them into this group. There is a clear relationship between growth and investment (Figure 4) and it is consistent with the positive relation provided by the theory.

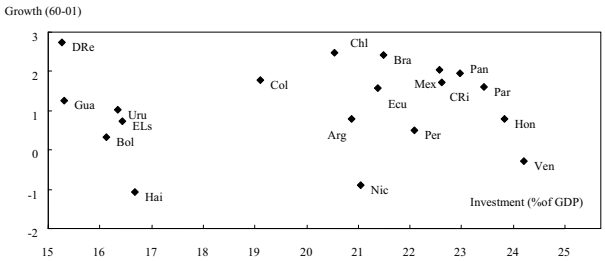

Figure 4
Latin America: Growth and investment (1990)

III.Fiscal policy

A considerable number of notable economic growth model researchers stipulate the importance of fiscal policy as growth determinant (Barro, 1991; De Gregorio, 1992; Easterly and Rebelo, 1993; De Gregorio, 2002). Particularly in Latin America the analysis on fiscal policy has almost exclusively been centered on their effect on monetary aggregates and inflation, and economic growth, during the last

15 years. This scenario serves as context for the development of recent works on the nexus long-term economic growth and fiscal policy (Fischer, 1991, 1993; Loayza et al., 2002, De Gregorio and Lee, 2003). According to Gavin and Perotti (1997), there are qualitative differences between Latin America and OECD country fiscal outcomes. First, fiscal outcomes have been more volatile in the region than in industrial economies. Second, fiscal policy has been pro-cyclical, and therefore economically destabilizing, in particular in recessions when exactly fiscal policy is called to play its countercyclical role (See Figure 5). Finally, fiscal shocks have been particularly disruptive in Latin America.

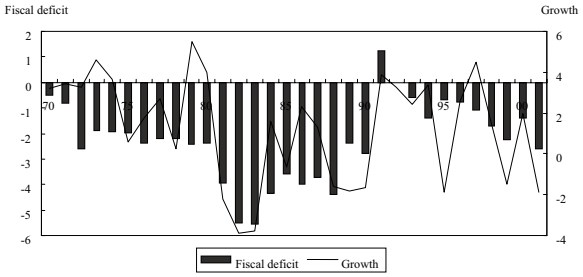

Figure 5
Latin America: Growth and fiscal deficit (1970-2001)

Reasons for pro-cyclicality of fiscal policy in the region are finance constraint faced by Latin American government during crisis, limited capital markets, inflationary environment, and the effect of the business cycle in electoral periods. Pertaining to the latter, explanations for this can be found in the political economy reason based on the increase of demands from all different groups as a reaction of a positive shock in revenues. Every group will have a "bigger piece of the pie," finally the sum of all the demands will exceed the sum of the total increase in revenues. Likewise there are other important characteristics that make Latin America fiscal policy unique from the other countries'. In the region, economies rely more on value added taxes (VAT) than income taxes that is the case for developed countries. In LAC economies the tax base is much smaller, which means that deficits can be considerably higher when they are measured as a proportion of total revenues. This aspect of fiscal policy may be significant when it comes to measure the state capability to raise additional resources to

Table 4
Latin America: Fiscal indicators (1960-2001)

	Tax				Social security	Education expen-ditures	Subsidies	Debt service
	Total	On goods	On Income	On intl. **Trade**				
Argentina	11.6	31.1	7.2	8.7	27.9	2.9	51.1	47.5
Bolivia	11.3	41.8	5.2	8.5	9.4	3.4	24.2	37.4
Brazil	17.5	21.7	16.7	2.8	27.3	4.1	44.3	51.5
Chile	20.8	41.1	16.7	8.4	9.8	3.6	48.4	35.8
Colombia	10.6	28.7	30.9	16.1	7.7	2.6	43.3	29.9
Costa Rica	17.8	31.7	13.1	18.7	25.3	4.6	25.6	22.7
D. Republic	13.0	26.5	18.1	38.2	3.9	2.0	13.3	13.7
Ecuador	12.7	20.8	44.8	27.1	0.0	2.4	20.0	30.8
El Salvador	10.0	36.1	18.2	12.2	12.3	2.5	6.8	13.3
Guatemala	9.0	32.0	13.2	29.9	3.1	1.7	11.1	14.7
Haiti	10.0	23.6	12.3	27.3	0.2	1.4	20.0	10.4
Honduras	12.1	29.0	22.9	34.1	2.3	3.6	3.8	24.2
Mexico	12.9	52.9	33.0	7.0	13.9	3.8	29.1	35.8
Nicaragua	20.6	43.9	11.7	17.6	11.3	3.4	16.0	27.7
Panama	18.4	15.7	20.4	11.3	22.1	4.8	19.8	8.8
Paraguay	9.6	26.6	12.1	17.6	7.0	2.4	18.7	14.5
Peru	12.2	45.3	17.5	17.2	3.5	3.1	21.3	30.0
Uruguay	22.7	38.8	8.8	8.4	27.8	2.8	51.3	28.3
Venezuela	16.8	11.5	51.5	9.2	4.0	4.5	29.3	20.4
LAC avg.	14.5	35.1	23.8	8.2	17.9	3.6	36.8	39.0

All ratios are shown as a percentage of GDP, except for debt service, that is a ratio of total exports.

cover the deficit. These issues will be analyzed deeply in the next sections.

In models with technology as exogenous variable and diminishing returns to the factors of production, economic policy can only have transitional effects on growth. That is the rationale of traditional neoclassical growth models. However, in models that emphasize technological change with spillover effects, national policies can enhance the factors of production and affect directly and positively economic growth. For that reason, finding what sort of economic policies may be compatible with endogenous growth theory based on technological factors is one of the main purposes of this thesis.

According to Easterly and Rebelo (1993) in order to isolate the effect of each fiscal variable, it is assumed that the impact of a change in a fiscal variable on government revenue or expenditure is compensated with lump sum taxes or subsidies. For example, it is commonly predicted that taxed on investment and income have a negative impact on growth, by affecting directly private returns to accumulation. However, not all sort of taxes lead to a decrease in growth. Depending on the type of model under study, the connection between taxes and economic growth could be either positive or negative, as we will see later on.

1.Saving and taxes

Saving has clear links with fiscal variables. For example, determined taxes will tend to have effects on savings through affecting inter-temporal consumption substitution. For instance, changing the tax base from income to consumption will encourage frugality in the economy, or expectations for reductions of international trade taxes will increase savings due to postponing present consumption. However, as Edwards (1994) has pointed out, there are doubts on the effectiveness of these tax mechanisms to increase aggregate savings. In our panel data, savings are correlated to income taxes (0.8), and negatively to VAT (-0.4) and international trade taxes (-0.2) as it is expected. However, the correlation for savings and other fiscal aggregates like total revenues (-0.1) and fiscal balance (-0.3.) are not significant. Also there are interesting suggestions that discard the effectiveness of taxation changes, and instead recommend the use of public savings via expenditures reduction as fiscal policy for economic growth.

2.Government and private consumption

Despite government and private consumption are components of the final aggregate consumption, government consumption crowds out private consumption,[19] but in less than one by one proportion, due to the substitution effect between the two variables.

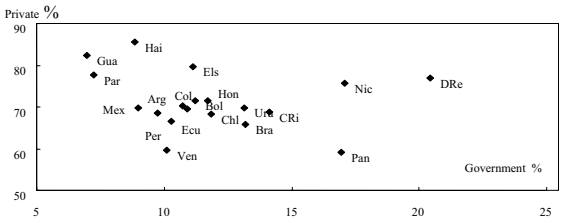

Figure 6
Latin America: Government and Private Consumption(1970-2001)

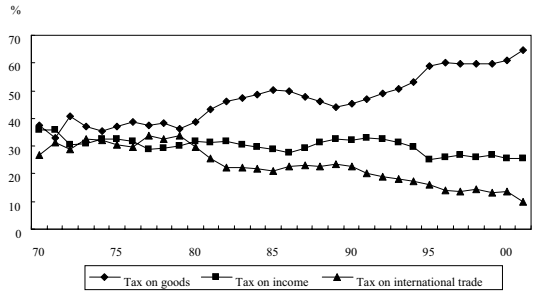

Figure 7
Latin America: Tax Revenue Components Trend (1970-2001)

According to the sort of tax another stylized fact has been observed in cross section and time series data. Taxes on income have shown an increasing trend, taxes on international trade have depicted a decreasing trajectory while taxes on goods and services have remained the same. In Figure 7 it is clear that before the eighties, value-added taxes, income taxes and international trade taxes had a very similar economic behavior, because Latin American countries had traditionally relied on indirect taxes, which include good and services and international trade taxes, as

much as they relied on direct taxes. In the 1980s, due to full-fledge economic reforms in Chile, and partial in other countries-Bolivia and Mexico, a decreasing trend for international trade and an increasing trend for goods and services taxes were observed. In the 1990s, when several countries joined the 'reformers club'-Argentina, Dominican Republic, El Salvador and Peru-those divergent trends became more evident. Tax revenues are not as volatile as GDP growth rate is. However, if we take a look at the standard deviations of each total revenue component at cross-country and time series level, we will find some interesting results.

Among VAT, income and international trade taxes, the most volatile in the region for the period 1960-2001 has been taxes on goods and services (5.3). This figure contrast evidently with the total revenue volatility of 0.8, and income tax (1.2) and international trade tax (2.8) volatility. If we analyze it in more detail, VAT is the only tax that has gradually has increase its volatility over the decades (1.3, 2.4 and 5.7), while for the income and international trade taxes, volatility has remained with no major change. Taxes on goods and services became very volatile in the 1990s (5.7). I believe that changes in the tax systems as part of the structural reforms in several countries have contributed to this to happen.

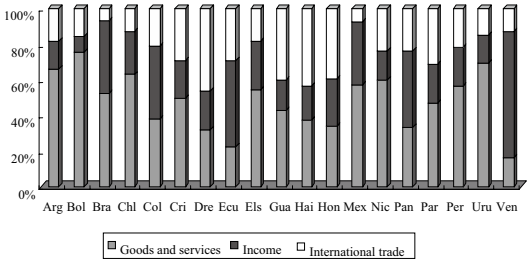

Figure 8
Latin America: Tax Composition (1970-2001)

Also across countries, volatility analysis gives interesting results. The most volatile economies in international trade taxes have been the smallest economies in the region, in terms of GDP per capita. Almost all Central American and Caribbean economies plus Ecuador shows very volatile international trade tax revenues. On the contrary, Central American economies volatility for goods and services and income taxes has been very low compared to the region average, especially for VAT which has been particularly volatile in the region, as it was documented before. Some individual cases to be emphasized are Argentina with highly volatile tax revenues of any sort. Venezuela has also volatile VAT and income taxes, El Salvador and Ecuador, on the contrary, have high volatility for income an international trade taxes.

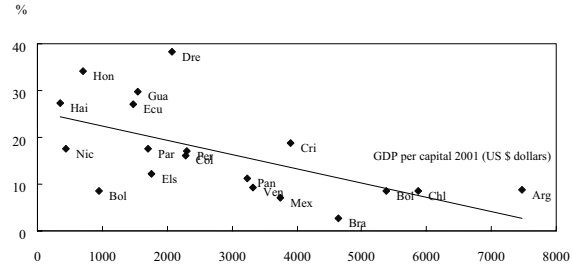

Figure 9
Latin America: Income Level and International Trade Tax (1970-2001)

Considering the differences of fiscal account results between developed and developing countries, and being aware of the heterogeneity within the region, where some countries are much closer to developed country standards, it was expected to find certain relationship between country size and certain sort of taxes that applies for OECD economies. For instance, it was expected to find a positive relationship between income taxes, and output per capita and population, but instead not clear relationship was found. In the case of international trade tax revenue, it decreases as the GDP per capita increases. When the latter variable is replaced by population the negative relationship remains.

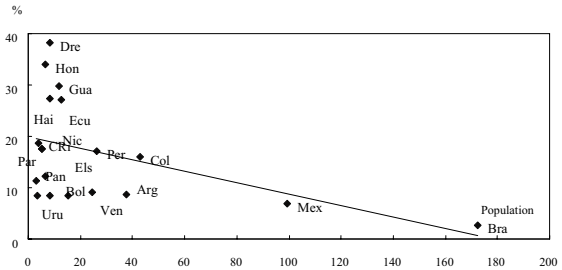

Figure 10
Latin America: Population and International Trade Tax (1970-2001)

Conclusions

This is the list of stylized facts on long-term economic growth in Latin American countries that can be drawn regarding total factor productivity, income-growth convergence and fiscal policy.

Stylized fact 1: In models that emphasize technological change with spillover effects, economic policies can enhance the factors of production and directly affect and have a positive impact on economic growth. Despite physical and human capital accumulation plays important role in economic growth, this does not account for the total economic growth or for growth path differences. Total factor productivity is the 'third' factor that has contributed to long-term economic growth in the region.

Stylized fact 2: The proportion of TFP increases with the rate of growth, especially in the 1990s, when its participation as an output source increased. However, TFP is composed of an assortment of different variables, one of them technological innovation or spillover effects, and since there is not much evidence of technological innovation in the region, it is assumed that positive externalities in addition to economic policy are important determinants of economic growth in LAC economies.

Stylized fact 3: In cross-country and time-series analysis, fast growing economies during the period 1960-2001 also have a high contribution of the ratio productivity growth on economic growth.

Stylized fact 4: There is empirical evidence of convergence in Latin America. One possible reason for the discrepancy between worldwide lack of convergence and the regional results may be the existence of some relative homogeneity in the sample.

Stylized fact 5: Direct taxes will tend to have effects on savings through or by affecting inter-temporal consumption substitution.

[1] De Gregorio (1992), De Gregorio and Lee (1999), Fajnzylber and Lederman, Easterly and Levine (2001), and Carranza, Fernández-Baca and Morón (2003) have made important contributions to the academic literature on Total Factor Productivity in Latin America.

[2] According to Easterly and Levine (2001), there is a significant TFP variation across Latin American countries, with an average of around 30 percent, while OECD countries registered 50 percent in average, and for East Asia economies, capital accumulation remains as the key component of economic growth. De Gregorio (1992) reports an average rate of 4.2 percent during the period 1950-1980, of which 51 percent is explained by investment, 30 percent by population growth, and the remaining 19 percent by TFP.

[3] It is assumed that there is no adjustment costs in capital accumulation, and that there is perfect competition in the production factors' markets, therefore they are paid according to their social marginal price.

[4] As De Gregorio and Lee (1999) report world-wide TFP studies have used a capital share of 0.4. While for same kind of data, Fischer (1991, 1993) considers a coefficient of 0.38. Beck et al. (2000) estimate a coefficient between 0.3 and 0.4. For their part, Easterly and Levine (2001) report a 0.5, and Loayza et al. (2002) a 0.35 coefficient in average for Latin American countries.

[5] Carranza et al (2003) refer to three possible explanations to this phenomenon. First, the sub-utilization or misallocation of inputs can push the TFP into a downward trend, with a severe lost in productivity. Second, the existence of informal sector, which is not included in TFP calculation, can be determinant for low productivity in the region. And third, the high unemployment and underemployment levels cause mismatches between the actual jobs and the training employees have. In the region a large proportion of people work in activities for which they are overqualified, but due to high unemployment rates, those workers have no other option than engage in jobs they cannot maximize their capabilities. Additionally, Prichett (1997) suggests that TFP calculation includes the amount of investment, but not its productivity. Then investment is overvalued, because it does not exclude the huge, unproductive or frivolous projects implemented in the name of some allegedly worthy cause, that were abundant during the 1960s and 1970s all over the region.

[6] Despite the rapid growth, it is estimated that in 2002 only 5 percent of the population had internet access, while for Americans this ratio is 44 percent, for Japanese 37, for Malaysians, French and Spanish around 15, and for Germans and Singaporeans around 30 percent.

[7] The IADB (2001) employs the Global Competitive Report index. This index ranks countries based on innovation and technological adaptation capacity, and shows that most of Latin American countries have performed very poorly, except for Chile, Brazil and Mexico. According to this report, while innovation is the major force behind

economic creativity in industrial countries, it is the transfer of technology that plays a more important role in the developing world and particularly in Latin America. This is due to the lack of credit and institutional support, such as weak rule of law and property rights issues, as it is noted in the report.

[8] The United States, Canada, Western Europe and East Asia account for the 99 percent of the total number of patents in the world (IADB, 2001), leaving for this region a participation of 0.2 percent. This figure could be confirmed if we take a look of Table 2, where the average number of patents for LAC countries is around 6 times less than Singapore and 30 times less than the United States. For expenditures on R&D as percentage of the national income, the United States registers almost 3 percent, Canada 1, while no Latin America country surpasses 0.5 percent, except for Brazil.

[9] If we considered exports with high technology content, LAC average is similar to the Spanish indicator, as it can be observed in Table 2, but in comparison to the United States, Japan, Singapore and Malaysia, this average is one forth or in the worst case, almost one tenth. If registered patents and filled trademarks applications are analyzed, the gap becomes even wider. In average Latin American countries accounts for one thirtieth of American registered patents, or one twentieth of American trademarks. In terms of royalties, LAC countries are net payers, as the positive figures in Table 2 indicates payments. On the contrary the United States is net receptor for this concept, while European countries, Japan and Southeast Asian countries show less difference between payments and receipts.

[10] Human resources in Latin America are also an obstacle for innovation. The number of scientific and technical publications is by far less than the number registered by other countries.

[11] For the variable internet users, Chile registers a figure four times higher than the average, and Argentina, Uruguay, Costa Rica and Peru are at the same level, doubling the LAC mean. Based on the number of scientific and technical journals the leader countries in human resources are also over the regional average, pertaining registered patents by residents and nonresidents and trademark applications. These countries are Argentina, Brazil, Chile and Mexico. These countries represent almost 80 percent of the total GDP of the region, and are also considered the most industrialized. It should not surprise us that the three largest economies in the region, Brazil, Mexico and Argentina, plus Costa Rica export manufactured goods with a high technological component higher than the Latin American average. The inclusion of the Costa Rican economy in this group with the highest index, almost four times than the regional average, is an unexpected result. It was stated that expenditures on research and development are by far lower than in the United States, Japan, Europe or Southeast Asian countries, and it barely reaches 0.5 percent of the GDP, except for Brazil (0.7 percent). For this variable, the leader countries remain the same, Argentina, Chile and Mexico, and El Salvador. The latter country shows an outstanding 2.2 percent of R&D expending which surpasses the average.

[12] Paraguay registered considerable revenues as collector of royalties and license fees (Table 2) due exclusively to the hydroelectric power resources. On the other side, Bolivia, surprisingly enter the group of high technology exports with a rate that doubles the LAC average. Bolivia's exports are mainly composed by natural gas and processed minerals, such as non-raw gold, tin alloys, zinc, ore, silver and platinum concentrates. Also 28 percent of total Costa Rica's exports come from high technology exports, in addition to its already known agricultural products. If we take a look of its detailed balance of payment, Costa Rica is increasingly exporting from 1998 office-machine parts, and from 1999, medical instruments.

[13] In LAC countries technological change is not the leading determinant of economic growth (Easterly and Levine, 2001).

[14] According to Sala-i-Martin (2002) the initial level of income is the most important and robust variable.

[15] The more homogenous the group the more convergence can be observed, as it was proved empirically by Barro and Sala-i-Martin (1997) when they developed a panel analysis for the United States across different states.

[16] After their independence from European monarchies, Latin American countries' political processes have been similar to certain extent, as well as their economic performances. Their common colonial history left a fairly significant legacy of political, cultural and social institutions that became the basis for the new republics.

[17] The most important regional groupings are the Andean Group, MERCOSUR (Southern Common Market), the G3 (Colombia, Mexico and Venezuela), Central American Common Market (CACM), and CARICOM (Caribbean Community).

[18] This is the case of Honduras, El Salvador, Nicaragua, Haiti, Guatemala, Colombia, and Peru.

[19] According to Giavazzi and Pagano (1990) a cut in government consumption causes no expectations for an increase of taxes, which in turn has positive effects on private consumption. This is called the "German view" which is against all Keynesian principles, even in the medium term.

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Crecimiento Económico de Largo Plazo, Factor Total de Producción, Convergencia y Política Fiscal en América Latina: Hechos estilizados desde la década de los sesenta

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Resumen

América Latina presenta un conjunto de “hechos estilizados” cuya identificación contribuirá a bosquejar una tentativa interpretación del comportamiento general de la región, y por ende reconocer los más importantes determinantes de crecimiento económico de largo plazo.

Además de la dinámica del ingreso per cápita, la tendencia y volatilidad del producto, así como la relevancia de las variables inversión-ahorro en la determinación del crecimiento de largo plazo, el factor total de producción, la convergencia del ingreso per cápita y la política fiscal han cumplido un rol fundamental en la dirección de la trayectoria de crecimiento de largo plazo.

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